distillate might be expected, I asked my friend Mr. Hatcher, late of King's College, to perform some experiments for me. The following are selected from his results.

1. A glass flask with a wide neck was filled about one-third with distilled water; it was boiled over a gas-burner, rapidly weighed, and replaced over the burner. After boiling twenty minutes, it was weighed again. The flask was once more filled to the original quantity, and some bits of coke were added; it was boiled and weighed as before, the gas-flame remaining unaltered all the time.

Results.—Water boiled away in the first trial (water only) 995 grains, in the second trial (with coke) 1130 grains.

Ratio of products, as 100 : 113·6.

2. Water was made to distil freely from a still, and the quantity collected in fifteen minutes was weighed. A few pieces of coke were then added to the water in the still, and the distillate collected again during fifteen minutes.

Results.—Distillate from water only, 293 grains; from water with coke, 310 grains.

Ratio of products, as 100 : 105·8.

3. A similar trial was made with common wood-charcoal; but the vessel having been made much cleaner by the action of the first boiling, the water boiled irregularly, with bumping. The addition of the charcoal made the boiling tranquil and regular.

Results.—Distillate from water only, 262 grains; from water with charcoal, 334 grains.

Ratio of results, as 100 : 127·4.

January 28, 1869.

Lieut.-General SABINE, President, in the Chair.

Pursuant to notice given at the last Meeting, Sir Henry Holland proposed, and Lord Justice Bovill seconded The Most Noble the Marquis of Salisbury for election and immediate ballot.

The ballot having been taken, the Marquis of Salisbury was declared duly elected.

Pursuant to notice given at the last Meeting, the question of the readmission of Sir John Macneill and Mr. Edward Solly was put to the vote, and the ballot having been taken, those two gentlemen were declared readmitted into the Society.

The following communications were read:—

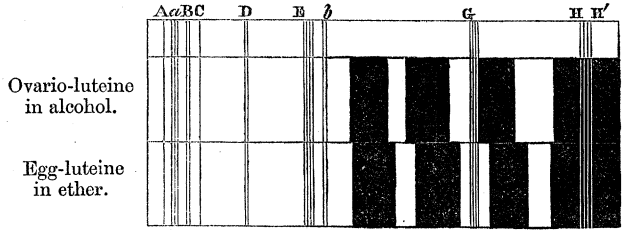
I. "Researches conducted for the Medical Department of the Privy Council, at the Pathological Laboratory of St. Thomas's Hospital." By J. L. W. THUDICHUM, M.D. Communicated by JOHN SIMON, Esq. Third Series.—Results of Researches on Luteine and the Spectra of Yellow Organic Substances contained in Animals and Plants. Received November 11, 1868.

1. *Name.*—Various parts of animals and plants contain a yellow crystallizable substance which has hitherto not been defined, and to which, from its prominent property, I assign the name of "luteine."

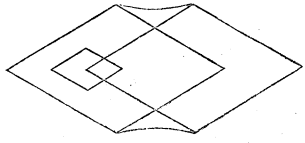
2. *Occurrence.*—It occurs normally in the corpora lutea of the ovaries of mammals, in the serum of the blood, the cells of the adipose tissue, and the yellow fat of the secretion of the mammary gland, or butter; in mammals it occurs abnormally in ovarian tumours and cysts, and in serous effusions. It is a regular ingredient of the yelks of the eggs of oviparous animals. In the vegetable world it is observed in seeds, such as maize; in the husks and pulps of fruits, such as anatto; in roots, such as carrots; in leaves, such as those of the coleus; and in the stamina and petals of a great variety of flowers.

3. *Properties.*—Luteine is easily soluble in alcohol, ether, and chloroform, but is insoluble in water. It is soluble in albuminous liquids, such as the contents of ovarian cysts and the serum of the blood. All these solutions are yellow; but the chloroform solution when concentrated has an orange-red colour.

4. *Spectrum.*—The spectrum of these solutions is distinguished by great brilliancy of the red, yellow, and green part, and by three absorption-bands, which are situated in the blue, indigo, and violet part of the spectrum. The positions of the absorption-bands vary a little with the different solvents.



5. *Crystallization.*—The crystals of luteine are apparently rhombic



plates, as shown in the accompanying figure, of which two or more are

always superposed in a curious manner. Possibly these crystals may be rhombohedra imperfectly developed on four of their edges. They are microscopic, yellow when thin, orange to red when thick, and have no resemblance to any other known animal or vegetable substance.

6. *Reactions.*—Luteine combines with few substances, mercury-acetate being perhaps the only ordinary reagent by which it is immediately and completely precipitated, as a yellow deposit. Mercury-nitrate produces a yellow precipitate, which on standing becomes white. Nitric acid poured over the crystals produces a blue colour, which immediately passes into yellow. The blue is not produced when nitric acid is added to either alcohol, chloroform, or ether solution, but appears with the solution in acetic acid and disappears again rapidly.

7. *Affinity for Fats.*—In the corpora lutea luteine is deposited in granules, which become the darker and larger the older the corpora grow. In the yelks of eggs it also exists in granules; and when extracted from any of these bodies it is always mixed with a considerable amount of an oily fat which contains cerebrine, and neutral fats, amongst them a peculiar fat containing phosphorus, like cerebrine. In butter after clarification it is found dissolved.

8. *Affinity for Albumen.*—On the other hand, luteine has great attraction to albumen, and can only with difficulty be extracted from serum or the fluid of ovarian cysts.

9. *Luteine in Vegetables.*—In vegetable matters luteine is contained in such a form that a clear watery solution cannot easily be obtained. All vegetable matters, however, readily yield their luteine to alcohol, and form by proper treatment clear solutions. In maize, luteine is accompanied by fats which are somewhat similar to those of eggs.

10. *Type of new Spectra.*—The spectrum of luteine is the type of the spectra of a series of bodies which are probably chemically identical; but not all yellow vegetable, animal, or chemical products are identical with luteine.

11. *New Spectra like that of Luteine.*—The yellow-coloured matters of the following plants present the spectrum of luteine, or one closely resembling it:—(1) Crocus or saffron (stamina); (2) *Helianthus annuus* (flower); the petals of the following plants—(3) *Leontodon taraxacum*, (4) *Leontodon* (*varietas* ?), (5) *Gazania elegans*, (6) Marigold common, (7) *Hypericum oblongifolium*, (8) *Acacia leprosa*, (9) *Galphimia splendens*, (10) *Stigmatophyllum ciliatum*, (11) *Lankesteria elegans*, (12) *Allamanda neriifolia*, (13) *Colutea frutescens*, (14) *Tagetes lucida*, (15) *Schkuhria atrovirens*, (16) *Diplotaxis tenuifolia*, (17) *Virgilia sylvatica*, (18) *Œnothera grandiflora*, (19) *Verbascum phlomoides*, (20) *Tagetes pumila*, (21) *Helianthus macrophyllus*, (22) *Chrysopsis villosa*, (23) *Helenium autumnale*, (24) *Obeliscaria pinnata*, (25) *Heliopsis lævis*, (26) *Linosyris vulgaris*, (27) *Berberis Darwinii*, (28) *Solidago serotina*, (29) *Ruta graveolens*, (30) *Melilotus elegans*, (31) *Medicago*

elegans, (32) *Allamanda Hendersonii*; (33) the *root* of the common carrot, *Daucus carota*; (34) the *seeds* of Indian corn, *Zea mays*. The extracts of the *berries* of the following plants also give the luteine spectrum:—(35) Anatto; (36) Asparagus; (37) *Physalis Alkekengi* (outer shell and inner berry); (38) *Solanum dulcamara*; (39) *Solanum capsicastrum*; (40) *Cyphomandra betacea*; (41) *Cratægus crus-galli*; (42) *Pyrus aria*.

12. *Uncertainty.*—In several of these matters only two absorption-bands are with certainty distinguished. The third, clearly observable *e.g.* in the extract from the common marigold, requires further researches with more powerful light.

13. *Yellow Bodies with one Band.*—The yellow principles contained in yellow-wood or fustic, in the flowers of the Calceolaria of ornamental gardens, and in the yellow fæces of sucking infants, show but one absorption-band, in the blue.

14. *Uranium Salts.*—The yellow solutions of uranium salts exhibit two absorption-bands in the blue, which are very different from any of the above bands.

15. *Spectra of Yellow Bodies with continued Absorption of Blue.*—A great number of yellow substances, amongst them some of the most important dye-stuffs, show spectra with continued absorption of blue, indigo, and violet, without any bands. On dilution the absorption gradually recedes towards violet. To this class belong (1) Rhamnine, from French berries; (2) Luteoline, from weld; (3) Quercitrine, from extract of quercitron or fluorine; (4) Turmeric; (5) Picric, and (6) Purrée, or Indian yellow; the orange-coloured solution of the petals of (7) *Coreopsis lanceolata*, (8) *Helichrysum bracteatum*; the light-yellow solution of (9) *Viola lutea*, (10) *Acacia decurrens*, (11) *Helianthus macrophyllus* (?), (12) *Berberis Darwinii* (?), (13) *Gnaphalium fœtidum*.

16. *Luteine not identical with Hematoidine or Cholophæine.*—Luteine differs entirely from hematoidine on the one, and from cholophæine on the other hand, and ought not, and after the elucidation of its spectral phenomena cannot, any longer be confounded with either of them.

17. *Error of Städeler and Holm.*—The bodies described by Holm and Städeler under the name of hematoidine are not hematoidine, but luteine.

18. *Robin's Hematoidine is Cholophæine.*—The bodies described by Valentiner, and by Robin, Riche, and Mercier, under the name of hematoidine, are not hematoidine, but cholophæine or bilirubine.

19. *Hematoidine peculiar.* — Hematoidine is a useful expression for certain microscopical crystals and amorphous bodies occurring in effused blood, the substance of which has not as yet been chemically isolated or defined.

20. *Luteine leads to new morphological views.*—The discovery of the identity of luteine from corpora lutea of mammals with that from yelks of eggs will probably lead to a revision of the present doctrines regarding the

homologies of the various parts of the ova of mammals and the eggs of birds and lower animals. Chemically the corpus luteum is the homologue of the yelk, genetically it is nearly so; but its use and destiny are totally different.

Note.—The foregoing researches are technical parts of inquiries carried on by the author at the Pathological Laboratory, St. Thomas's Hospital, for the Medical Department of the Privy Council, in continuation of researches already published in the Ninth and Tenth Reports of the Medical Officer of the Privy Council.

The special thanks of the author are due to Dr. Hooker, Director of the Royal Botanical Gardens, Kew, for the kindness and liberality with which he supplied, through Mr. Smith, the Curator, most of the botanical specimens examined in the course of this research.

II. "On Hydrofluoric Acid." By G. Gore, F.R.S. Received November 14, 1868.

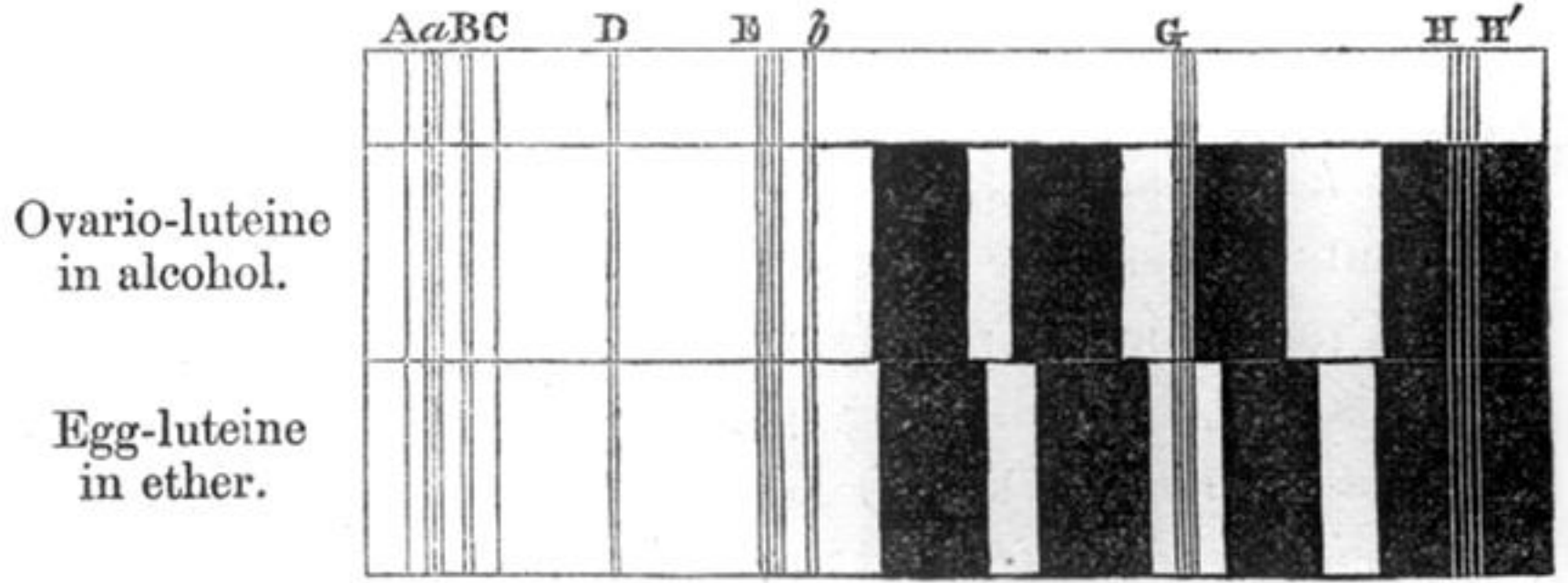
(Abstract.)

A. *Anhydrous Hydrofluoric Acid.*

This paper contains a full description of the leading physical and chemical properties of anhydrous hydrofluoric acid, and also an account of various properties of pure aqueous hydrofluoric acid. The author obtained the anhydrous acid by heating dry double fluoride of hydrogen and potassium to redness in a suitable platinum apparatus (shown by a figure accompanying the paper), and states the conditions under which it may be obtained in a state of purity.

The composition and purity of the anhydrous acid are shown and carefully verified by various methods of analysis, both of the double fluoride from which it was prepared and of the acid itself; and particulars are given of all the circumstances necessary to insure reliable and accurate results. Nearly all the operations of preparing, purifying, analyzing, and examining the properties of the acid were conducted in vessels of platinum, with lutings of paraffin, sulphur, and lampblack; articles of transparent and colourless fluor-spar were also employed in certain cases. Nearly all the manipulations with the acid were effected while the vessels containing it were immersed in a strong freezing-mixture of ice and crystallized chloride of calcium.

The pure anhydrous acid is a highly dangerous substance, and requires the most extreme degree of care in its manipulation. It is a perfectly colourless and transparent liquid at 60° Fahr., very thin and mobile, extremely volatile, and densely fuming in the air at ordinary temperatures, and absorbs water very greedily from the atmosphere. It was perfectly retained in platinum bottles, the bottle having a flanged mouth with a platinum plate secured with clamp-screws, and a washer of paraffin.


A a B C
D
E
b
G
H H′
Ovario-luteine in alcohol.
Egg-luteine in ether.